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A COMMUNICATION SYSTEM

BACKGROUND OF THE INVENTION

Field of the Invention

This invention relates to a communication technology in communication for E-mail on a network, especially to a communication system for transmitting and receiving a voice file attached to the E-mail on the network.

Description of the Related Art

In recent years, in communication between personal computers, use of an E-mail which includes character information has prospered by development of computer network technology. Moreover, as communication information different from character information, use of the voice file attached to the E-mail has also increased.

Specifically, the latest personal computer has a speaker for itself, and a user can hear sound of the voice file attached to the E-mail received from the mail server, from the speaker.

SUMMARY OF THE INVENTION

An object of the invention is to provide a communication system having high convenience and cost performance in use, which includes a plurality of computers connected to a network and a plurality of

telephone sets each of which is disposed to be corre-
sponded to one of those computers.

A communication system according to the
invention comprises: a mail server for receiving and
5   storing a mail, to which a voice file is attached,
through a network; a plurality of computers for receiv-
ing the mail from the mail server through the network;
a file communication apparatus for receiving the voice
file through the network; and a plurality of telephone
10   sets connected to the file communication apparatus,
wherein each of the telephone sets is disposed in
correspondence with one of the computers.

The communication apparatus includes: manage-
ment means for storing information about a correspond-
15   ing relationship between telephone numbers of the
telephone sets and network addresses of the computers;
receiving means for receiving the network address and
the voice file which are transmitted from one of the
computers; storing means for storing the voice file
20   received by the receiving means; conversion means for
converting the stored voice file into a voice signal;
transmitting means for transmitting the voice signal;
and control means for obtaining the telephone number
corresponding to the received network address based on
25   the relationship in the management means, and for
controlling the transmitting means to transmit the
voice signal to the telephone set corresponding to the
obtained telephone number.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 shows a schematic diagram of a communication system according to the 1st embodiment of the invention.

5 Fig. 2 shows a block diagram of the communication system according to the 1st embodiment of the invention.

Fig. 3 shows a data construction in an address management portion of the communication system

10 according to the 1st embodiment of the invention.

Fig. 4 shows a flow sequence in operation of the communication system according to the 1st embodiment of the invention.

Fig. 5 shows a schematic diagram of a communication

15 nication system according to the 2nd embodiment of the invention.

Fig. 6 shows a block diagram of the communication system according to the 2nd embodiment of the invention.

20 Fig. 7 shows a flow sequence in operation of the communication system according to the 2nd embodiment of the invention.

Fig. 8 shows a flow sequence in operation in another mode of the communication system according to

25 the 2nd embodiment of the invention.

Fig. 9 shows a schematic diagram of a communication system according to the 3rd embodiment of the invention.

Fig. 10 shows a block diagram of the communication system according to the 3rd embodiment of the invention.

Fig. 11 shows a flow sequence in operation of the communication system according to the 3rd embodiment of the invention.

Fig. 12 shows a flow sequence in operation in another mode of the communication system according to the 3rd embodiment of the invention.

DETAILED DESCRIPTION OF THE EMBODIMENTS

Referring to the drawings, the 1st embodiment of the invention is explained as follows.

First, with reference to Fig. 1, a schematic structure of the communication system in the 1st embodiment of this invention is explained.

A file communication apparatus 101, a mail server unit 102, three personal computers 103, 104 and 105 are connected with a Local Area Network (LAN) 100. Also, three of the telephone sets for extensions 106, 107 and 108 are connected with the file communication apparatus 101 and each other through a connection line L1. Further, each personal computer 103, 104 or 105 is disposed in correspondence with one of the telephone sets 106, 107 and 108. Also, the telephone set 106, 107 or 108 is the type of the conventional analog standard telephone set. Each personal computer 103, 104 or 105 connected with the LAN 100 is capable of

transmitting/receiving an E-mail to/from the mail
server unit 102.

Also, each personal computer 103, 104 or 105
has lots of hardware such as a CPU, a memory and a
5 modem, and can perform various kinds of functions each
of which can be operated on a display screen of the
personal computer.

With reference to Fig. 2, a structure and a
function of the personal computer 103 are explained in
10 detail as an example of the above personal computers.
The personal computer 103 has a communication control
portion 110 which has a function as a communication
interface with the file communication apparatus 101.
Also, a mail receiving portion 113 receives the E-mail
15 from the mail server unit 102 through the communication
control portion 110. A main control portion 114 trans-
mits a voice file of the E-mail received by the commu-
nication control portion 110, to a file storing portion
111, and the file storing portion 111 stores the voice
20 file therein. A file transmitting portion 112 is
capable of transmitting the voice file stored in the
file storing portion 111. Further, the main control
portion 114 has a function for controlling each of the
above portions (means) of the personal computer 103.

25 The file communication apparatus 101 of the
embodiment is explained as follows.

The file communication apparatus 101 has lots
of hardware such as a CPU, a memory and various kinds

of communication means.

In detail, the file communication apparatus 101 has a LAN controller which transmits and receives an Ethernet packet on the LAN 100, and various kinds of

5 software such as a driver software which controls the operation of the LAN controller and a software which controls the network protocol in communication of the Ethernet packets on the LAN 100. Also, the file communication apparatus 101 can perform data communications

10 on the LAN 100.

With reference to the functional block diagram of Fig. 2, the file communication apparatus 101 includes a communication control portion 120 which performs data communication through the LAN 100. The

15 communication control portion 120 has a controller which transmits an Ethernet packet, the software which controls the operation of the controller, and the software for network communication.

A file receiving portion 121 receives a voice

20 file through the communication control portion 120 which has the data communication function. Also, a file storing portion 122 stores the voice file which the file receiving portion 121 received. An address management portion 123 stores the extension numbers of

25 the telephone sets and the network addresses on LAN of the personal computers, and each telephone number corresponds to one of the network addresses of the personal computers as pairs (referring to Fig. 3).

Next, with reference to Figs. 1 and 3, the construction of data stored in the address management portion 123 of the file communication apparatus 101 is explained. The telephone set 106 has the extension

5   number "1" corresponding to the network address <192.168.0.1> which the personal computer 103 has. Also, the telephone set 107 has the extension number "2" corresponding to the network address <192.168.0.2> which the personal computer 104 has. Furthermore, the

10   telephone set 108 has the extension number "3" corresponding to the network address <192.168.0.3> which the personal computer 105 has.

Further, a code processing portion 124 processes the received voice file according to an

15   encoding method of a DA conversion portion 125 so that the DA conversion portion 125 can reproduce the voice file, and stores the processed voice file (hereinafter referring to as "voice data") in a memory portion of the code processing portion 124. The code processing

20   portion 124 transmits periodically to the DA conversion portion 125 a predetermined amount of the voice data coincided with an encoding rate of the DA conversion portion 125. Moreover, the DA conversion portion 125 has a function for converting the voice data into an

25   analog voice signal. The analog voice signal can be converted to sound in the telephone set.

Further, a telephone control portion 126 has a function as the communication interface with the

telephone set. Specifically, the telephone control portion 126 has a function for transmitting a bell signal, a function for detecting a hook-state of the telephone set, a function for detecting a tone-dial

5 signal and a pulse dial signal, a function for transmitting and receiving analog voice signals, and a function for supplying an electric power to the telephone set. Moreover, a main control portion 127 controls the above portions (means) of the file communication

10 apparatus 101.

With reference to Figs. 2 to 4, the schematic sequence flow in the operation of the communication system of the embodiment structured as above is explained as follows.

15 Specifically, the operation processes from when an E-mail with a voice file from the mail server unit 102 is received by the personal computer 103, until when the telephone set 106 corresponding to the personal computer 103 outputs sound of the voice file received through the file communication apparatus 101

20 are explained.

First, the personal computer 103 which has the network address <192.168.0.1> transmits a mail-transmission request (signal) to the mail server unit

25 102 (Step 1). The mail server unit 102 checks an ID password from the personal computer 103, and if it corresponds, transmits the E-mail to the personal computer 103 (Step 2). Next, the mail receiving

portion 113 of the personal computer 103 receives the
E-mail with the voice file from the mail server unit
102 through the communication control portion 110, and
the personal computer 103 displays the contents of the

5　E-mail on the display screen (Step 3).

　　　　Since the voice file is attached to the E-
mail, the icon of the voice file is displayed on the
display screen of the personal computer 103 (not
shown). Then, a user performs a voice reproduction

10　direction through the display screen by clicking a
computer mouse with a cursor superimposed on the icon
of the voice file on the display screen (Step 4). That
is, by the click, the main control portion 114 trans-
mits a transmission direction to the file transmitting

15　portion 112 after receiving the voice reproduction
direction. By receiving the transmission direction,
the file transmitting portion 112 forwards the voice
file from the file storing portion 111 to the communi-
cation control portion 110 (Step 5). The communication

20　control portion 110 has a memory in which the network
address of the file communication apparatus 101 was
stored, and is set so as to forward the voice file to
the file communication apparatus 101 by receiving the
above direction.

25　　　　Next, the communication control portion 110
forwards the voice file to the file communication
apparatus 101 in compliance with the communication
protocol after adding the network address of the

personal computer 103 to a header portion of the voice
file in compliance with the communication protocol
(Step 6).

Next, in the file communication apparatus
5 101, the file receiving portion 121 receives the voice
file and the network address attached to the header
portion of the voice file, and stores them in the file
storing portion 122.

Further, the main control portion 127 trans-
10 mits the network address <192.168.01> of the personal
computer 103 to the address management portion 123
(Step 7). Simultaneously, the main control portion 127
forwards the voice file stored in the file storing
portion 122 to the code processing portion 124 (Step
15 7). Also, the file storing portion 122 deletes the
voice file automatically after transmitting the voice
file to the code processing portion 124. The voice
file is capable of being deleted at step 20 by the
direction of the main control portion 127.

20 After receiving the network address
<192.168.01>, the address management portion 123
detects the extension number "1" corresponding to the
received network address <192.168.01> on the basis of
the relationship (refer to Fig. 3) between the network
25 addresses and the extension numbers (Step 8), and then
informs the main control portion 127 of a notice
indicating that the corresponding extension number
existed in the relationship. Next, the code processing

portion 124 processes the voice file in compliance with
the encoding method of the DA conversion portion 125,
and stores the processed voice file (hereinafter refer-
ring to as "voice data") in the memory portion (Step
5   9).

After receiving the notice, the main control
portion 127 directs the address management portion 123
to transmit the extension number "1" to the telephone
control portion 126 (Step 10). Then, the telephone
10 control portion 126 transmits a bell signal (incoming
signal), as an off-hook request signal, to the
telephone set 106 having the extension number "1" (Step
11). The telephone set 106 generates a bell sound by
receiving the bell signal.

15   When the user hangs off the receiver of the
telephone set 106, an off-hook signal (response signal)
is transmitted from the telephone set 106 to the
telephone control portion 126 of the file communication
apparatus 101. Next, the telephone control portion 126
20 detects the response signal, and transmits the detec-
tion result to the main control portion 127 (Step 12).
Then, the main control portion 127 directs the code
processing portion 124 to transmit the voice data to
the DA conversion portion 125.

25   Next, the code processing portion 124 trans-
mits the voice data to the DA conversion portion 125
according to the coding sampling cycle and the number
of coding bits of the DA conversion portion 125 (Step

13). Then, the DA conversion portion 125 converts the
digital voice data into an analog voice signal, and
transmits the analog voice signal to the telephone set
106 through the telephone control portion 126 (Step

5   14). The analog voice signal is adapted to be changed
to sound in the telephone set 106. Finally, the
telephone set 106 outputs the voice file as sound from
the receiver of the telephone set 106.

As explained above, the user can hear the

10   sound of the voice file certainly from the start by
receiving the analog voice data of the voice file,
which is generated by transmitting the digital voice
data form the code processing portion 124 to the DA
converting portion 125, when the user hangs off the

15   receiver of the telephone set 106.

If the bell signal of the file communication
apparatus 101 is different from the bell signal of the
extension telephone set 106, the user can know whether
the voice mail have reached or not.

20   Next, after finishing transmitting the voice
file, the code processing portion 124 sends a notice of
the voice-file transmission finishing to the main
control portion 127. Further, the main control portion
127 directs the telephone control portion 126 to trans-

25   mit a reorder tone signal indicating the voice-file
transmission finishing to the telephone set 106, and
waits for a response indicating that the line was
disconnected (the on-hook signal) from the telephone

set 106.

In the embodiment of the invention, however, the user can hear the sound of the voice file from the start again by performing a predetermined key input

5 operation while the telephone control portion 126 is outputting the voice signal or after the telephone control portion 126 finishes transmitting the voice signal.

In the operation of the embodiment, the re-

10 output direction of the voice signal is transmitted from the telephone set 106 to the file communication apparatus 101 by pushing the predetermined keys of the telephone set 106.

Specifically, the above-mentioned predeter-

15 mined key operation is to push an asterisk key twice. A signal by pushing the asterisk key is transmitted to the telephone control portion 126 of the file communi- cation apparatus 101 (Step 15), and the telephone control portion 126 detects the signal of the key as

20 the re-output request signal. Next, the telephone control portion 126 informs the main control portion 127 of a notice indicating that the telephone control portion 126 received the re-output direction. By receiving the notice, the main control portion 127

25 directs the code processing portion 124 to retransmit the voice data stored in the memory portion to the DA conversion portion 125 (Step 16). After receiving the re-output direction, the code processing portion 124

transmits the voice data to the DA converting portion
125 again (Step 17). Then, the DA conversion portion
125 converts the digital voice data to the analog voice
signal, and then transmits the analog voice signal of
5 the voice file to the telephone set 106 through the
telephone control portion 126 (Step 18).

By pushing the predetermined key of the
telephone set 106, the user can hear again the sound of
the voice file which the user failed to hear.

10 Next, if the user hangs up the receiver of
the telephone set 106, the telephone control portion
126 receives a response (an on-hook signal) (Step 19).
Upon reception of the on-hook signal, the telephone
control portion 126 informs the main control portion
15 127 of a notice indicating that the telephone control
portion 126 detected the on-hook of the telephone set
106. After receiving the notice, the main control
portion 127 directs the code processing portion 124 to
delete the voice file in the memory portion (Step 20).

20 Since the voice file stored in the memory
portion of the code processing portion 124 is deleted
automatically by the direction of the main control
portion 127, it is not necessary to leave the voice
file. Therefore, it causes the storage capacity of the
25 memory portion to be small.

As explained above, according to this embodi-
ment, in the communication system in which the personal
computer connected to the network and the analog

standard telephone set are corresponded to each other, it is possible to realize the reproduction function in high user convenience and high cost performance.

Referring to the drawings, the 2nd embodiment
5   of the invention is explained as follows.

First, with reference to Fig. 5, a schematic structure of the communication system in the 2nd embodiment of the invention is explained as follows.

In this embodiment, the telephone set is the
10 type of the analog proprietary telephone set. The telephone set of this type has an analog voice channel and a signal control channel separately, and the file communication apparatus can set a speaker of the telephone set to be on or off.

15   A file communication apparatus 201, a mail server unit 102, and three personal computers 103, 104 and 105 are connected with a Local Area Network (LAN) 100. Also, three extension telephone sets 206, 207 and 208 are connected with the file communication apparatus
20 201 and each other through a connection line L2. Further, each personal computer 103, 104 or 105 is disposed in correspondence with one of the telephone sets 206, 207 and 208. The connection line L2 has an analog communication line and a digital signal communi-
25 cation line. Each personal computer 103, 104 or 105 connected with the LAN 100 is capable of transmit-ting/receiving an E-mail to/from the mail server unit 102.

Also, since the personal computer of the 2nd
embodiment has the same structure and the same function
as those of the personal computer of the 1st embodi-
ment, the detailed explanation about the personal
5 computer is omitted.

Next, with reference to Fig. 6, the file
communication apparatus 201 of the embodiment is
explained.

In detail, the file communication apparatus
10 201 has a LAN controller which transmits and receives
an Ethernet packet on the LAN 100, and lots of software
such as a driver software which controls the operation
of the LAN controller, and a software which controls
the network protocol in communication of the Ethernet
15 packets on the Ethernet, etc.

With reference to the functional block
diagram of Fig. 6, the file communication apparatus 201
has a communication control portion 210 which performs
data communications through the LAN 100. The communi-
20 cation control portion 210 has a controller which
transmits an Ethernet packet, the software which
controls the operation of the controller, and the soft-
ware for network communication.

A file receiving portion 211 receives a voice
25 file through the communication control portion 210.
Also, a file storing portion 212 stores the voice file
which the file receiving portion 221 received. An
address management portion 213 stores the extension

numbers of the telephone sets and the network addresses on the LAN of the personal computers, and each extension number corresponds to one of the network addresses of the personal computers as pairs (referring to Fig.

5   3).

Next, with reference to Figs. 3 and 6, the construction of data stored in the address management portion 213 of the file communication apparatus 201 is explained.

10   Referring to Fig. 6, the file communication apparatus 201 is connected with the telephone sets for extension 206, 207 and 208. Also, the network addresses are added to the personal computers 103, 104 and 105. The network addresses and the extension

15   numbers of the telephone sets are stored in the address management portion 213 with each addresses corresponded to one of the extension numbers as pairs. Specifically, the telephone set 206 has the extension number "1" corresponding to the network address <192.168.0.1>

20   which the personal computer 103 has. Also, the telephone set 207 has the extension number "2" corresponding to the network address <192.168.0.2> which the personal computer 104 has. Furthermore, the telephone set 208 has the extension number "3" corresponding to

25   the network address <192.168.0.3> which the personal computer 105 has.

Further, a code processing portion 214 processes the received voice file according to the

encoding method of a DA conversion portion 215 so that
the DA conversion portion 215 can reproduce the voice
file, stores the processed voice file (hereinafter
referring to as "voice data") in the memory portion of
5   the code processing portion 214, and transmits periodi-
cally a predetermined amount of the digital voice data
according to an encoding rate of the DA conversion
portion 215. Moreover, the DA conversion portion 215
has the function for converting the digital voice data
10 into an analog voice data.

        Further, a telephone control portion 216 has
a function as a communication interface to the above
telephone sets. Specifically, the telephone control
portion 216 has a function for transmitting a direction
15 signal to transmit a bell signal to the telephone sets,
a signal occurred by changing on-hook or off-hook state
of the telephone set, and a signal occurred by pushing
the keys or dialing, through the channel for data
control being different from the analog channel for
20 voice communication.

        Further, the telephone control portion 216
has a function for communicating a bell signal, an on-
hook-state detection signal of a telephone, and a tone-
dial detection. Also, a main control portion 217
25 controls the above portions of the file communication
apparatus 201.

        With reference to Figs. 5 to 7, the schematic
sequence flow in the operation of the communication

system of the embodiment structured as above is
explained as follows.

Specifically, the operation processes from
when an E-mail with a voice file from the mail server
5   unit 102 is received by the personal computer 103,
until when the telephone set 206 corresponding to the
personal computer 103 outputs a voice signal of the
voice file received through the file communication
apparatus 201 is explained.

10   First, the personal computer 103 which has
the network address <192.168.0.1> transmits a mail-
transmission request signal to the mail server unit 102
(Step 21). The mail server unit 102 detects an ID
password from the personal computer 103, and if it
15   corresponds, transmits the E-mail to the personal
computer 103 (Step 22). Next, the mail receiving
portion 113 of the personal computer 103 receives the
E-mail with the voice file from the mail server unit
102 through the communication control portion 110, and
20   the personal computer 103 displays the contents of the
E-mail on the display screen (Step 23).

Since the voice file is attached to the E-
mail, the icon of the voice file is displayed on the
display screen of the personal computer 103 (not
25   shown). Then, a user performs a voice reproduction
direction through the display screen by clicking a
computer mouse with a cursor superimposed on the icon
of the voice file (Step 24). That is, by the click,

the main control portion 114 transmits a transmission
direction to the file transmitting portion 112 after
receiving the voice reproduction direction. Next, by
receiving the transmission direction, the file trans-
5   mitting portion 112 forwards the voice file from the
file storing portion 113 to the communication control
portion 110 (Step 25). The communication control
portion 110 has a memory in which the network address
of the file communication apparatus 201 was stored.
10 The communication control portion 110 is set so as to
forward the voice file to the file communication
apparatus 201 by receiving the above direction.

Next, the communication control portion 110
forwards the voice file to the file communication
15 apparatus 201 in compliance with the communication
protocol after adding the network address of the
personal computer 103 to a header portion of the voice
file in compliance with the communication protocol
(Step 26).

20   Next, in the file communication apparatus
201, the file receiving portion 211 receives the voice
file and the network address attached to the header
portion of the voice file, and stores them in the file
storing portion 212.

25   Further, the main control portion 217 trans-
mits the network address <192.168.01> of the personal
computer 103 to the address management portion 213
(Step 27). Simultaneously, the main control portion

217 forwards the voice file stored in the file storing
portion 212 to the code processing portion 214 (Step
27). Also, the file storing portion 212 deletes the
voice file automatically after transmitting the voice
5 file to the code processing portion 214. The voice
file is capable of being deleted at step 40 by the
direction of the main control portion 217.

   After receiving the network address, the
address management portion 213 detects the extension
10 number "1" corresponding to the received network
address <192.168.01> on the basis of the relationship
(refer to Fig. 3) between the network addresses and the
extension numbers (Step 28). The address management
portion 213 informs the main control portion 217 of a
15 notice indicating that the corresponding extension
number existed in the relationship. Next, the code
processing portion 214 processes the voice file in
compliance with the encoding method of the DA conver-
sion portion 215, and stores the processed voice file
20 (hereinafter referring to as "voice data") in the
memory portion (Step 29).

   Further, after receiving the notice, the main
control portion 217 directs the address management
portion 213 to transmit the extension number "1" to the
25 telephone control portion 216 (Step 30). Then, the
telephone control portion 216 transmits a bell signal
(incoming signal) as an off-hook request to the
telephone set 206 through the signal control channel

(digital signal line) (Step 31). The telephone set 206
generates a bell sound by receiving the bell signal.

　　　　When the user hangs off the receiver of the
telephone set 206, an off-hook signal (response signal)
5　is transmitted from the telephone set 206 to the
telephone control portion 216 of the file communication
apparatus 201 through the signal control channel
(digital signal line) (Step 32). Next, the telephone
control portion 216 detects the response signal, and
10　transmits the detection result to the main control
portion 217. Furthermore, the main control portion 217
directs the code processing portion 214 to transmit the
voice data to the DA conversion portion 215.

　　　　Next, the code processing portion 214 trans-
15　mits the voice data to the DA conversion portion 215
according to the coding sampling cycle and the number
of coding bits of the DA conversion portion 215 (Step
33). Then, the DA conversion portion 215 converts the
digital voice data to the analog voice signal, and then
20　transmits the analog voice signal to the telephone set
206 through the telephone control portion 216 and the
analog voice channel (Step 34).

　　　　The analog voice signal is adapted to be
converted to sound in the telephone set 206. Finally,
25　the telephone set 206 outputs the voice file as sound
from the receiver of the telephone set 206.

　　　　As explained above, the user can hear the
sound of the voice file certainly from the start by

receiving the analog voice signal of the voice file which is generated by transmitting the digital voice data from the code processing portion 214 to the DA converting portion 215, when the user hangs off the

5   receiver of the telephone set 206.

If the bell signal of the file communication apparatus 201 is different from the bell signal of the extension telephone set 206, the user can know whether the voice signal have reached or not.

10   Next, after finishing transmitting the voice file, the code processing portion 214 sends a notice of the voice-file transmission finishing to the main control portion 217. The main control portion 217 directs the telephone control portion 216 to transmit

15   the reorder tone signal indicating the voice-file transmission finishing to the telephone set 206 through the signal control channel (digital signal line), and waits for a response indicating that the line was disconnected (the on-hook signal) from the telephone

20   set 206.

In the embodiment of the invention, however, the user can hear the sound of the voice file from the start again by performing a predetermined key input operation while the telephone control portion 216 is

25   outputting the voice signal or after the telephone control portion 216 finishes transmitting the voice signal.

In the operation of the embodiment, the re-

output direction of the voice signal is transmitted
from the telephone set 206 to the file communication
apparatus 201 by pushing the predetermined keys of the
telephone set 206.

5   Specifically, the above-mentioned predeter-
mined key operation is to push an asterisk key twice.
A signal by pushing the asterisk key is transmitted to
the telephone control portion 216 of the file communi-
cation apparatus 201 through the signal control channel
10   (digital signal line) (Step 35). The telephone control
portion 216 transmits the signal to the main control
portion 217. Then, the main control portion 217
detects the signal of the key as a re-output request
signal. Next, the main control portion 217 directs the
15   code processing portion 214 to retransmit the voice
data to the DA conversion portion 215 (Step 36). After
receiving the re-output direction, the code processing
portion 214 forwards the digital voice data to the DA
conversion portion 215 again (Step 37). Then, the DA
20   conversion portion 215 converts the digital voice data
into the analog voice signal, and then forwards the
analog voice signal to the telephone set 206 through
the telephone control portion 216 and the analog voice
channel (Step 38).

25   By pushing the predetermined key of the
telephone set 206, the user can hear again the sound of
the voice file which the user failed to hear.

Next, if the user hands up the receiver of

the telephone set 206, the telephone control portion
216 receives the response (the on-hook signal) (Step
39). Upon reception of the response, the telephone
control portion 216 informs the main control portion
5   217 of a notice indicating that the telephone control
portion 216 detected the on-hook of the telephone set
206. After receiving the notice, the main control
portion 217 directs the code processing portion 214 to
delete the voice file in the memory portion (Step 40).

10   Since the voice file stored in the memory
portion of the code processing portion 214 is deleted
automatically by the direction of the main control
portion 217, it is not necessary to leave the voice
file. Therefore, it causes the storage capacity of the
15 memory portion to be small.

        Furthermore, with reference to the Fig. 6,
the telephone set 206 of the system according to the
embodiment has a speaker 206b on the telephone main
portion side, apart from the receiver side. Therefore,
20 the user can hear the caller's voice from the speaker
206b without hanging off the receiver of the telephone
set 206. This conventional function is so called
"hands-free" function.

        Next, operation of the file communication
25 apparatus 201 and the telephone set 206 in the embodi-
ment of the invention when the telephone set 206 is set
in the hands-free mode is explained.

        By the address management portion 213 of the

file communication apparatus 201, the user can set the
"hands-free" mode and the ordinary calling mode in the
telephone set 206, and can register them in the address
management portion 213.

5   With reference to the Figs. 6 and 8, the
operational sequence of the communication system in the
"hands-free" mode in the embodiment of the invention is
explained as follows.

          Also, referring to Fig. 8, since the sequence
10   from steps 21 to 31 is the same as that from steps 21
to 31 in the mode explained before, the detailed expla-
nations about the sequence in those steps are omitted.

          In brief, by the voice reproduction direction
from the personal computer 103, the address management
15   portion 213 of the file communication apparatus 201
notifies the extension number "1" through the digital
signal control channel to the telephone control portion
216. The telephone control portion 216 transmits an
incoming signal (incoming request for automatically
20   connecting the telephone line) to the telephone set 206
corresponding to the extension number "1". After
receiving the incoming signal, the corresponding
telephone set 206 turns to be available in outputting
sound from the speaker 206b automatically.

25   Then, the telephone set 206 informs the main
control portion 217, through the telephone control
portion 216, of a notice indicating that the speaker
206b of the telephone set 206 was changed to be

available to output sound (step 32a), and the main
control portion 217 directs the code processing portion
214 to forward the voice data to the DA conversion
portion 215. By receiving the direction, the code
5 processing portion 214 transmits the voice data to the
DA conversion portion 215 (step 33a). Then, the DA
conversion portion 215 converts the digital voice data
into the analog voice signal, and then forwards the
analog voice signal to the telephone set 206 through
10 the telephone control portion 216 and the analog voice
signal channel (step 34a). After receiving the analog
voice signal, the telephone set 206 outputs the sound
from the speaker 206b. In this mode, a bell ring
signal from the file communication apparatus 201 and an
15 off-hook notice from the telephone set 206 are not
necessary to transmit the analog voice signal to the
telephone set 206.

      If the user pushes the predetermined key of
the telephone set 206 while the speaker 206b is
20 outputting the sound of the voice signal or after the
speaker 206b finishes outputting the sound, the
telephone set 206 transmits the signal as the request
for reproduction of the sound, to the telephone control
portion 216 of the file communication apparatus 201
25 through the signal control channel (step 35a). Then,
the telephone control apparatus 216 transmits the
signal to the main control portion 217, and the main
control portion 216 directs the code processing portion

214 to retransmit the voice data to the DA conversion
portion 215 (step 36a). After receiving the direction,
the code processing portion 214 forwards the voice data
to the DA conversion portion 215 (step 37a). Then, the
5 DA conversion portion 215 converts the digital voice
data into the analog voice signal, and then forward the
analog voice signal to the telephone set 206 through
the telephone control portion 216 and the analog voice
signal channel (step 38a). After receiving the analog
10 voice signal, the telephone set 206 outputs the sound
from the speaker 206b, so that the user can hear the
sound from the start again.

Further, by pushing an off switching for
disconnecting the line of the telephone set 206 even
15 while the sound is outputting from the speaker 206b,
the signal by pushing the switch is transmitted to the
main control portion 217 through the telephone control
portion 216 and the digital signal control channel
(step 39a). Then, the main control portion 217 directs
20 the telephone control portion 216 to disconnect the
line, and directs the code processing portion 214 to
stop forwarding the analog voice data (step 40a). By
receiving the direction, the code processing portion
214 stops forwarding the analog voice data, and deletes
25 the voice data of the voice file stored in the memory
portion.

In this embodiment, the speaker 206b of the
telephone 206 set can be utilized as the speaker for

the personal computer 103.

    As explained above, according to this embodi-
ment, in the communication system in which the personal
computer connected to the network and the analog
5 proprietary telephone set are corresponded to each
other, it is possible to realize the reproduction func-
tion in high user convenience and high cost perform-
ance.

    Referring to the drawings, the 3rd embodiment
10 of the invention is explained as follows.

    First, with reference to Fig. 9, a schematic
structure of the communication system in the 3rd
embodiment of the invention is explained as follows.

    In this embodiment, the telephone set is the
15 type of the digital telephone set.

    A file communication apparatus 301, a mail
server unit 102, and three personal computers 103, 104
and 105 are connected with a Local Area Network (LAN)
100. Also, three extension telephone sets 306, 307 and
20 308 are connected with the file communication apparatus
301 and each other through a connection line L3. The
connection line L3 has a digital signal line for commu-
nication for a digital voice signal and a digital
control signal. Further, each personal computer 103,
25 104 or 105 is disposed in correspondence with one of
the telephone sets 306, 307 and 308. Each personal
computer 103, 104 or 105 connected with the LAN 100 is
capable of transmitting/receiving an E-mail to/from the

mail server unit 102. Moreover, since the personal
computer of the 3rd embodiment has the same structure
and the same function as those of the personal computer
of the 1st embodiment, the explanation about the
5 personal computer is omitted.

Next, with reference to Fig. 10, the file
communication apparatus 301 of the embodiment is
explained.

In detail, the file communication apparatus
10 301 has a LAN controller which transmits and receives
an Ethernet packet on the LAN 100, and lots of software
such as a driver software which controls the operation
of the LAN controller, and a software which controls
the network protocol in communication of the Ethernet
15 packets on the Ethernet, etc.

Also, the file communication apparatus 301
has a communication control portion 310 which performs
data communications through the LAN 100. The communi-
cation control portion 310 has a controller which
20 transmits an Ethernet packet, the software which
controls the operation of the controller, and the
software for network communication.

A file receiving portion 311 receives a voice
file through the communication control portion 310.
25 Also, a file storing portion 312 stores the voice file
which the file receiving portion 311 received. An
address management portion 313 stores the extension
numbers of the telephone sets and the network addresses

on LAN of the personal computers. Each extension
number corresponds to one of the network addresses of
the personal computers as pairs (referring to Fig. 3).

Next, with reference to Figs. 3 and 10, the
5   construction of data stored in the address management
portion 313 of the file communication apparatus 301 is
explained. Referring to Fig. 10, the file communica-
tion apparatus 301 is connected with the telephone sets
for extension 306, 307 and 308. Also, the network
10 addresses are added to the personal computers 103, 104
and 105. The network addresses and the extension
numbers of the telephone sets 306, 307 and 308 are
stored in the address management portion 313 with each
network address corresponded to one of the extension
15 numbers as pairs. Specifically, the telephone set 306
has the extension number "1" corresponding to the
network address <192.168.0.1> which the personal
computer 103 has. Also, the telephone set 307 has the
extension number "2" corresponding to the network
20 address <192.168.0.2> which the personal computer 104
has. Furthermore, the telephone set 308 has the exten-
sion number "3" corresponding to the network address
<192.168.0.3> which the personal computer 105 has.

Further, the code processing portion 314
25 processes the received voice file according to the
encoding method of a telephone control portion 315,
stores the processed voice file (hereinafter referring
to as "voice data") in the memory portion of the code

processing portion 314, and transmits periodically a
predetermined amount of the voice data to the telephone
control portion 315 according to an encoding rate of
the telephone control portion 315. Moreover, the
5 telephone control portion 315 has a function for a
communication interface to the telephone sets. The
voice signal can be converted to sound in the telephone
set. Specifically, the telephone control portion 315
has a function for transmitting a direction signal to
10 transmit a bell signal to the telephone set, a signal
occurred by changing on-hook or off-hook state of the
telephone set, and a signal by pushing the keys or
dialing, through the channel for data communication.
Further, the telephone control portion 315 has a func-
15 tion for communicating a bell signal, a signal which
indicates the detection of on-hook of a telephone set
and the detection of tone dial. Also, the main control
portion 317 controls the above portions in the communi-
cation apparatus 301.

20   Next, with reference to Figs. 10 and 11, the
schematic sequence flow in the operation of the commu-
nication system of the embodiment structured as above
is explained.

       Specifically, the operation processes from
25 when an E-mail with a voice file from the mail server
unit 102 is received by the personal computer 103,
until when the telephone set 306 corresponding to the
personal computer 103 outputs a voice signal of the

voice file received through the file communication
apparatus 301 is explained.

First, the personal computer 103 which has
the network address <192.168.0.1> transmits a mail-
5   transmission request to the mail server unit 102 (Step
41). The mail server unit 102 detects an ID password
from the personal computer 103, and if it corresponds,
transmits the E-mail to the personal computer 103 (Step
42). Next, the mail receiving portion 113 of the
10   personal computer 103 receives the E-mail with the
voice file from the mail server unit 102 through the
communication control portion 110, and the personal
computer 103 displays the contents of the E-mail on the
display screen (Step 43).

15   Since the voice file is attached to the E-
mail, the icon of the voice file is displayed on the
display screen of the personal computer 103 (not
shown). Then, a user performs a voice reproduction
direction through the display screen by clicking a
20   computer mouse with a cursor superimposed on the icon
of the voice file (Step 44). That is, by the click,
the main control portion 114 transmits a transmission
direction to the file transmitting portion 112 after
receiving the voice reproduction direction. By
25   receiving the transmission direction, the file trans-
mitting portion 112 forwards the voice file to the
communication control portion 110 (Step 45). The
communication control portion 110 has a memory in which

a network address of the file communication apparatus 301 was stored. The communication control portion 110 is set so as to forward the voice file to the file communication apparatus 301 by receiving the above direction.

Next, the communication control portion 110 forwards the voice file to the file communication apparatus 301 in compliance with the communication protocol after adding the network address of the personal computer 103 to a header portion of the voice file in compliance with the communication protocol (Step 46).

Next, in the file communication apparatus 301, the file receiving portion 311 receives the voice file and the network address attached to the header portion of the voice file, and stores them in the file storing portion 312.

Furthermore, the main control portion 317 transmits the network address <192.168.01> of the personal computer 103 to the address management portion 313 (Step 47). Simultaneously, the main control portion 317 forwards the voice file stored in the file storing portion 312 to the code processing portion 314 (Step 47). Also, the file storing portion 312 deletes automatically the voice file after transmitting the voice file to the code processing portion 314. The voice file is capable of being deleted at step 60 by the direction of the main control portion 317.

After receiving the network address, the
address management portion 313 detects the extension
number "1" corresponding to the received network
address <192.168.01> on the basis of the relationship
5   (refer to Fig. 3) between the network addresses and the
extension numbers (Step 48). The address management
portion 313 informs the main control portion 317 of a
notice indicating that the corresponding extension
number existed in the relationship. Next, the code
10   processing portion 314 converts the voice file into a
voice file (hereinafter referring to as "voice data")
in compliance with the coding method which can
reproduce the telephone control portion 315, and stores
the voice data in the memory portion (Step 49).

15   Further, after receiving the notice, the main
control portion 317 directs the address management
portion 313 to transmit the extension number "1" to the
telephone control portion 315 (Step 50). Then, the
telephone control portion 315 transmits an incoming
20   signal (bell signal) as an off-hook request to the
telephone set 306 (Step 51). The telephone set 306
generates a bell sound by receiving the bell signal.

When the user hangs off the receiver of the
telephone set 306, an off-hook signal (response signal)
25   is transmitted from the telephone set 306 to the
telephone control portion 315 of the file communication
apparatus 301 (Step 52). Next, the telephone control
portion 315 detects the response signal, and transmits

the detection result to the main control portion 317. Furthermore, the main control portion 317 directs the code processing portion 314 to transmit the voice data to the telephone control portion 315.

5   Next, the code processing portion 314 transmits the voice data to the telephone control portion 315 according to the coding sampling cycle and the number of coding bits of the telephone control portion 315 (Step 53). Then, the telephone control portion 315

10   converts the digital voice data into a digital voice signal, and transmits the digital voice signal to the telephone set 306 (Step 54). The digital voice signal is adapted to be converted to sound in the telephone set 306. Finally, the telephone set 306 outputs the

15   contents of the voice file as sound from the receiver of the telephone set 306.

As explained above, the user can hear sound of the voice file certainly from the start by receiving the digital voice signal of the voice file which is

20   generated by transmitting the voice data from the code processing portion 314 to the telephone control portion 315, when the user hangs off the receiver of the telephone set 306.

If the ring signal of the file communication

25   apparatus 301 is different from the ring signal of the extension telephone set 306, the user can know whether the voice mail have reached or not.

Next, after finishing transmitting the voice

file, the code processing portion 314 sends a notice
indicating that the transmission of the voice file is
finished, to the main control portion 317. Further,
the main control portion 317 directs the telephone
5 control portion 315 to transmit the reorder tone signal
indicating that the transmission of the voice file is
finished, to the telephone set 306, and waits for a
response indicating that the line was disconnected (the
on-hook signal) from the telephone set 306.

10   In the embodiment of the invention, however,
the user can hear the sound of the voice file from the
start again by performing a predetermined key input
operation while the telephone control portion 315 is
outputting the digital voice signal or after the
15 telephone control portion 315 finishes transmitting the
digital voice signal.

         In the operation of the embodiment, the re-
output direction of the voice signal is transmitted
from the telephone set 306 to the file communication
20 apparatus 301 by pushing the predetermined keys of the
telephone set 306.

         Specifically, the above predetermined key
operation is to push an asterisk key twice. A signal
by pushing the asterisk key is transmitted to the
25 telephone control portion 315 of the file communication
apparatus 301 (Step 55). The telephone control portion
315 transmits the signal to the main control portion
317 (step 56), and the main control portion 317 detects

the signal of the key as a re-output request signal.
By receiving the direction, the main control portion
317 directs the code processing portion 314 to
retransmit the digital voice data stored in the memory

5　portion to the telephone control portion 315. Then,
the code processing portion 314 forwards the voice data
stored in the code processing portion 314 to the
telephone control portion 315 again (Step 57). Then,
the telephone control portion 315 transmits the digital

10　voice signal of the voice file to the telephone set 306
by the direction (Step 58). The digital voice signal
is adapted to be converted to sound in the telephone
set 306.

　　　By pushing the predetermined key of the

15　telephone set 306, the user can hear again the sound of
the voice file which the user failed to hear.

　　　Next, if the user hangs up the receiver of
the telephone set 306, the telephone control portion
315 receives the response (the on-hook signal) (Step

20　59). By the reception of the response, the telephone
control portion 315 detects the on-hook signal, and
informs the main control portion 317 of a notice
indicating that the telephone control portion 315
detected the on-hook of the telephone set 306. After

25　receiving the notice, the main control portion 317
directs the code processing portion 314 to delete the
voice data in the memory portion (Step 60).

　　　Since the voice data stored in the memory

portion of the code processing portion 314 is deleted automatically by the direction of the main control portion 317, it is not necessary to leave the voice file. Therefore, it causes the storage capacity of the

5 memory portion to be small.

As explained above, according to this embodiment, in the system in which the personal computer connected to the network and the digital telephone set are corresponded to each other, it is possible to realize

10 the reproduction function in high user convenience and high cost performance, and by the system having a compact construction in design.

Furthermore, with reference to Fig. 10, the telephone set 306 of the communication system in the

15 embodiment has a speaker 306b on the telephone main portion side. Therefore, the user can hear the caller's voice from the speaker 306b without hanging off the receiver of the telephone set 306, apart from the receiver side. This conventional function is so

20 called "hands-free" function.

Next, when the telephone set 306 is set in the hands-free mode, operation of the file communication apparatus 301 and the telephone set 306 in the embodiment of the invention is explained.

25 By the address management portion 313 of the file communication apparatus 301, the user can set the "hands-free" mode and the ordinary calling mode of the telephone set 306, and can register them in the address

management portion 313.

 With reference to the Figs. 9, 10 and 12, the operational sequence of the communication system in the "hands-free" mode in the embodiment of the invention is

5 explained as follows.

 Also, referring to Fig. 12, since the sequence from steps 41 to 51 is the same as that from steps 41 to 51 in the ordinary calling mode explained before, the detailed explanations about the sequence in

10 those steps are omitted.

 In brief, according to the voice reproduction direction from the personal computer 103, the address management portion 313 of the file communication apparatus 301 notifies the extension number "1" to the

15 telephone control portion 315. Then, the telephone control portion 315 transmits an incoming signal (request for connecting the telephone line) to the telephone set 306 corresponding to the extension number "1". After receiving the incoming signal, the corre-

20 sponding telephone set 306 turns to be available in outputting sound from the speaker 306b automatically.

 Then, the telephone set 306 informs the main control portion 317 through the telephone control portion 316 of a notice indicating that the speaker

25 306b of the telephone set 306 is changed to be available to output sound (step 52a). The main control portion 317 directs the code processing portion 314 to transmit the voice data.

By receiving the direction, the code process-
ing portion 314 transmits the voice data to the
telephone control portion 315 (step 53a). Then, the
telephone control portion 315 converts the digital

5 voice data into the digital voice signal, and forwards
the digital voice signal to the telephone set 306 (step
54a). In this mode, a bell signal from the file commu-
nication apparatus 301 and an off-hook notice from the
telephone set 306 are not necessary to transmit the

10 digital voice signal to the telephone set 306.

If the user pushes the predetermined key of
the telephone set 306 while the speaker 306b is
outputting sound of the digital voice signal or after
the speaker 306b finishes outputting the sound, the

15 telephone set 306 transmits the signal as the request
for reproduction of the sound, to the telephone control
portion 315 of the file communication apparatus 301
(step 55a). Further, the telephone control portion 315
transmits the signal to the main control portion 317.

20 Further, the main control portion 317 directs the code
processing portion 314 to retransmit the voice data to
the telephone control portion 315 (step 56a). Next,
the code processing portion 314 transmits the digital
voice data to the telephone control portion 315 (step

25 57a). Then, the telephone control portion 315 forwards
the digital voice signal converted from the digital
voice data, to the telephone set 306. Finally, since
the telephone set 306 outputs the sound from the

speaker 306b by receiving the digital voice signal, the user can hear the sound from the start again.

Further, by pushing an on and off switch for connecting and disconnecting the line of the telephone set 306 even while the sound is outputting from speaker 306b, the signal by the pushing the switch is transmitted to the main control portion 317 through the telephone control portion 315 (step 59a). Then, the main control portion 317 directs the telephone control portion 315 to disconnect the line, and directs the code processing portion 314 to stop forwarding the voice data (step 60a). By receiving the direction, the code processing portion 314 deletes automatically the voice data of the voice file in the memory portion (step 60a).

In this embodiment, the speaker 306b of the telephone set 306 can be utilized as the speaker for the personal computer 103.

As explained above, according to this embodiment, in the system in which the personal computer connected to the network and the digital telephone set are corresponded to each other, it is possible to realize the reproduction function in high user convenience and high cost performance.

Many modifications and variations of the present invention are possible in the light of the above techniques. It is therefore to be understood that within the scope of the appended claims, the

invention may be practiced otherwise than as specifi-
cally described.